CLAIMS

1.   A method for extracting component feature for face description, comprising:

5   processing a training mode operation, comprising;

analyzing a plurality of training face images;

calculating a first -order eigencomponent $U^{(1)}$ using the analyzed training face images;

calculating a second -order eigencomponent $U^{(2)}$ using the

10   analyzed training face images; and

processing a test mode operation, comprising;

analyzing a test face image; and

obtaining a second -order component feature $W^{(2)}$ for the test face image using the second -order eigencomponents $U^{(2)}$.

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2.   A method for extracting component feature for face description, comprising:

processing a training mode operation, comprising;

analyzing a plurality of training face images to generate a first -

20   order residue component $\Gamma^{(1)}$ of the training face;

calculating a first -order eigencomponent $U^{(1)}$ using the first -order residue component $\Gamma^{(1)}$ of the training face;

analyzing the first -order eigencomponent $U^{(1)}$ to generate a second -order residue component $\Gamma^{(2)}$ of the training face; and

calculating a second -order eigencomponent $U^{(2)}$ using the second -order residue component $\Gamma^{(2)}$ of the training face; and

processing a test mode operation, comprising;

analyzing a test face image to generate a first -order residue component $\Gamma^{(1)}$ of the test face;

obtaining a first -order component feature $W^{(1)}$ for the test face image using the first -order eigencomponent $U^{(1)}$ and the first -order residue component $\Gamma^{(1)}$ of the test face;

analyzing the first -order component feature $W^{(1)}$ to generate a second -order residue component $\Gamma^{(2)}$ of the test face; and

obtaining a second -order component feature $W^{(2)}$ for the test face image using the second -order eigencomponents $U^{(2)}$ and the second -order residue component $\Gamma^{(2)}$ of the test face .

3. The method for extracting component feature as claimed in claim 2, wherein said analyzing a plurality of training face image comprises:

dividing each sample face image into facial parts to obtain facial components Φ_i of facial parts;

averaging the facial component of each facial parts to obtain a first -order average facial component Ψ ; and

subtracting the facial component by the first -order average facial component Ψ to produce the first -order residue component $\Gamma^{(1)}$ of the training face.

4.   The method for extracting component feature as claimed in claim 2, wherein said analyzing the first -order eigencomponent comprises:

obtaining a reconstructed matrix $\hat{\Gamma}^{(1)}$; and

subtracting the reconstructed matrix $\hat{\Gamma}^{(1)}$ from the first -order residue

5   component $\Gamma^{(1)}$ of the training face to generate the second -order residue component $\Gamma^{(2)}$ of the training face.

5.   The method for extracting component feature as claimed in claim 2, wherein said analyzing a test face image comprises:

10   dividing the test face image into facial parts to obtain facial components Φ_i of facial parts; and

subtracting the facial component Φ_i by the first -order average facial

component Ψ to produce the first -order residue component $\Gamma^{(1)}$ of the test face.

15   6.   The method for extracting component feature as claimed in claim 2, wherein said analyzing a test face image comprises:

obtaining a reconstructed matrix $\hat{\Gamma}^{(1)}$; and

subtracting the reconstructed matrix $\hat{\Gamma}^{(1)}$ from the first -order residue component $\Gamma^{(1)}$ of the test face to generate the second -order residue

20   component $\Gamma^{(2)}$ of the test face.

7.   The method for extracting component feature as claimed in claim 3, wherein said facial components Φ_i of facial parts of the training face images can be weighted.

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8.   The method for extracting component feature as claimed in claim 5, wherein said facial components Φ_i of facial parts of the test face images can be weighted.

9.   An apparatus for extracting component feature for face description, comprising:

an arrangement operable to processes a training mode operation, comprising;

an arrangment operable to analyze a plurality of training face images;

an arrangement operable to calculate a first -order eigencomponent $U^{(1)}$ using the analyzed training face images;

an arrangement operable to calculate a second -order eigencomponent $U^{(2)}$ using the analyzed training face images; and

an arrangement operable to process a test mode operation, comprising;

an arrangement operable to analyze a test face image; and

an arrangement operable to obtain a second -order component feature $W^{(2)}$ for the test face image using the second -order eigencomponents $U^{(2)}$.

10.   An apparatus for extracting component feature for face description, comprising:

an arrangement operable to process a training mode operation, comprising;

an arrangement operable to analyze a plurality of training face images to generate a first -order residue component $\Gamma^{(1)}$ of the training face;

an arrangement operable to calculate a first -order eigencomponent $U^{(1)}$ using the first -order residue component $\Gamma^{(1)}$ of the

5   training face;

an arrangement operable to analyze the first -order eigencomponent $U^{(1)}$ to generate a second -order residue component $\Gamma^{(2)}$ of the training face; and

an arrangement operable to calculate a second -order

10   eigencomponent $U^{(2)}$ using the second -order residue component $\Gamma^{(2)}$ of the training face; and

an arrangement operable to process a test mode operation, comprising;

an arrangement operable to analyze a test face image to generate a first -order residue component $\Gamma^{(1)}$ of the test face;

15   an arrangement operable to obtain a first -order component feature $W^{(1)}$ for the test face image using the first -order eigencomponent $U^{(1)}$ and the first -order residue component $\Gamma^{(1)}$ of the test face;

an arrangement operable to analyze the first -order component feature $W^{(1)}$ to generate a second -order residue component $\Gamma^{(2)}$ of the test

20   face; and

an arrangement operable to obtain a second -order component feature $W^{(2)}$ for the test face image using the second -order eigencomponents $U^{(2)}$ and the second -order residue component $\Gamma^{(2)}$ of the test face .

11. The apparatus for extracting component feature as claimed in claim 10, wherein said arrangement operable to analyze a plurality of training face images comprises:

an arrangement operable to divide each sample face image into facial parts to obtain facial components Φ_i of facial parts;

an arrangement operable to average the facial component of each facial parts to obtain a first -order average facial component Ψ; and

an arrangement operable to subtract the facial component by the first -order average facial component Ψ to produce the first -order residue component $\Gamma^{(1)}$ of the training face.

12. The apparatus for extracting component feature as claimed in claim 10, wherein said arrangement operable to analyze the first -order eigencomponent comprises:

an arrangement operable to obtain a reconstructed matrix $\hat{\Gamma}^{(1)}$; and

an arrangement operable to subtract the reconstructed matrix $\hat{\Gamma}^{(1)}$ from the first -order residue component $\Gamma^{(1)}$ of the training face to generate the second -order residue component $\Gamma^{(2)}$ of the training face.

13. The apparatus for extracting component feature as claimed in claim 10, wherein said arrangement operable to analyze a test face image comprises:

an arrangement operable to divid the test face image into facial parts to obtain facial components Φ_i of facial parts; and

an arrangement operable to subtract the facial component Φ_i by the first -order average facial component Ψ to produce the first -order residue component $\Gamma^{(1)}$ of the test face.

5   14.   The apparatus for extracting component feature as claimed in claim 10, wherein said arrangement operable to analyze a test face image comprises:

an arrangement operable to obtain a reconstructed matrix $\hat{\Gamma}^{(1)}$; and

an arrangement operable to subtract the reconstructed matrix $\hat{\Gamma}^{(1)}$ from the first -order residue component $\Gamma^{(1)}$ of the test face to generate the second -

10   order residue component $\Gamma^{(2)}$ of the test face.

15.   The apparatus for extracting component feature as claimed in claim 11, wherein said facial components Φ_i of facial parts of the training face images can be weighted.

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16.   The apparatus for extracting component feature as claimed in claim 12, wherein said facial components Φ_i of facial parts of the test face images can be weighted.

20   17.   An apparatus for extracting component feature for face description, comprising:

an arrangement operable to process a training mode operation, comprising;

an arrangement operable to analyze a plurality of training face

25   images to generate a first -order residue component $\Gamma^{(1)}$ of the training face;

an arrangement operable to calculate a first -order eigencomponent $U^{(1)}$ using the first -order residue component $\Gamma^{(1)}$ of the training face;

an arrangement operable to analyze the first -order

5   eigencomponent $U^{(1)}$ to generate a second -order residue component $\Gamma^{(2)}$ of the training face; and

an arrangement operable to calculate a second -order eigencomponent $U^{(2)}$ using the second -order residue component $\Gamma^{(2)}$ of the training face.

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18.   An apparatus for extracting component feature for face description, comprising:

a memory for storing a first order average facial component Ψ, a first order eigencomponents $U^{(1)}$, an inverse matrix $U^{(1)+}$, and a second order

15   eigencomponent $U^{(2)}$; and

an arrangement operable to process a test mode operation, comprising;

an arrangement operable to analyze a test face image to generate a first -order residue component $\Gamma^{(1)}$ of the test face;

an arrangement operable to obtain a first -order component

20   feature $W^{(1)}$ for the test face image using the first -order eigencomponent $U^{(1)}$ and the first -order residue component $\Gamma^{(1)}$ of the test face;

an arrangement operable to analyze the first -order component feature $W^{(1)}$ to generate a second -order residue component $\Gamma^{(2)}$ of the test face; and

an arrangement operable to obtain a second -order component feature $W^{(2)}$ for the test face image using the second -order eigencomponents $U^{(2)}$ and the second -order residue component $\Gamma^{(2)}$ of the test face .